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The MONTHLY REVIEW

Published by the

American Electro-Platers' Society

A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTRO-PLATING

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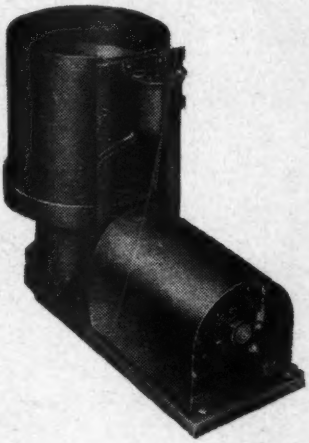

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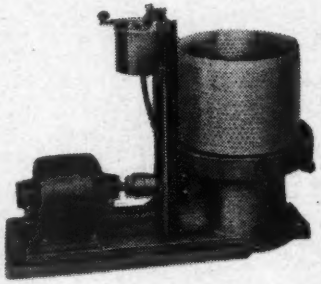

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Published by the
AMERICAN ELECTRO-PLATERS' SOCIETY

Publication and Editorial Office
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VOL. XXII AUGUST 1935 NO. 8

Address of

Mr. Charles E. Proctor

Founder of the A. E. S.

I have incorporated in a short address some thoughts in regard to present conditions, so far as The American Electro-Platers' Society at large and its future welfare are concerned. I am going to take you back a good many years, before this organization was actually founded, when I was taught to do things, when I was a young fellow and had to do things, because we had a good many older platers around and they seemed to think I had accomplished a great deal in a very short period of time.

When I first went into the plating business, I was driven into it. I was married too soon and lost my job because of politics. I was made a citizen in this city. The organization for which I worked were quite rank and out Republicans, and I had some different ideas. When I ran away from home and came to this country, my idea was that where there was liberty, there was my country. When I came to Bridgeport and they saw I never had taken the oath of allegiance, they said, "Now you always want to be a staunch Republican." I said, "I have other ideas besides Republicanism. I think perhaps I will vote the Democratic ticket." Eventually Captain David Durand, who was connected with the Ansonia Brass and Copper Company at that time, said, "Look here, Charley, if you don't vote the Republican ticket you are not going to stay with this organization." I said, "All right. Goodbye," and I went out.

I got married about that time. I was one of those young chaps who liked to go around. I had lots of friends and spent all my money in dressing up. Some of the old-timers used to see me go from plant to plant. I would walk down from Derby

with a stovepipe hat and a gold-headed cane and a flower in my coat. Of course, I would go downtown, and if there was anything there that I wanted, I could get it because my uncle was a manufacturer. That is the way things went in those days.

I am going to speak somewhat of conditions as I have found them in my world travels, and I am going to speak of conditions as I see them in the United States. I hope you will give attention to what I have to say. There are very few ladies here at the present time, but this is addressed to the one lady here, even if the others are not here.

It gives my a great deal of pleasure to preside at the opening session of the Twenty-Third Annual Convention of our Society and I sincerely hope this Convention will prove to be the greatest and most beneficial to the Society of any previous one held.

You have come to this splendid city of Bridgeport to deliberate, to concentrate, collectively for the future welfare of the Society and its continuation as a great electrochemical and industrial organization founded more than a quarter of a century ago with one great idea in mind, that is, to raise the standard of the electro-plating industry in the United States and Canada. It was my aim for the Society in its betterment of the knowledge of the electro-plater that it might become, in the future, a valued contribution to this great nation of ours.

During its history of a quarter of a century it has progressed with this ideal in view. The past, however, lies behind us, so it is not to the past that we must consecrate our united efforts but to the future and its greater possibilities, if we desire to write its glorious progress on the future pages of its history. I know and realize as much as any person can know, having been intimately connected with the electro-plating industry for nearly half a century and having traveled continuously in its interest for twenty years or more and thus having been personally in touch with all the great manufacturing plants in this country who fabricated and electroplated their products, what the present problems of the foreman plater are.

We must all realize that they are basically due today to the tremendous unsettled conditions in this great country of ours which has become disrupted and in a continuous political turmoil to such an extent that the metal fabricating industry of which electro-plating is an integral part, has become unbalanced

in its normal operations and will continue so until we revert back again to a sane basic condition and realize that there is only one sane law in the country or in any country which means prosperity and that is the natural law of supply and demand. This law has always been the true arbiter, always will be, no other law can replace it.

Only when our lawmakers come to a saner realization of this natural law, then and not until then, is it possible to see the dawn of a newer prosperity, and until they do we shall continue to be in the terrible predicament we are in today with millions of unemployed. When the factory whistle blows calling all these millions back to work again, then and only then, will prosperity return to even a 1926 basis. The divine law is still unalterable that by the "sweat of the brow ye shall eat your bread." Labor and labor alone is the true basis of wealth.

During my visit to Japan last July, I talked with a business man in Kobe regarding business in general and world conditions. In referring to my own country he said, "We Japanese do not understand why your great country has developed so many conflicting problems; it would seem as though you have what you term 'too many political bosses'. They all seem to be in a quandary, one wants one measure to be adopted, another wants a different one. You have a trite saying (he continued) that United you Stand, Divided you Fall. Apparently you continue to fall. A nation cannot long endure and prosper when politicians are not unanimous for the best interests of the country and the people whom they are elected to represent." He further mentioned: "It is really unfortunate for your great country, she will prosper later on. Everyone works in Japan, they are a 'United Nation'. If American workmen had to labor as the Japanese do, they would consider themselves industrial slaves."

The Japanese work in unity for the welfare of their country, they have made wonderful progress since Admiral Perry visited them in 1853. Again it proves that labor means industrial wealth, there is no other way. Money must be earned to represent the wealth of any nation, not wasted as we are wasting it today in the United States.

We have an excellent President in Franklin D. Roosevelt. Whether we are Democrats or Republicans, we must admit this to be true, and we only hope that his ideals to solve our problems

will come true. The question is, will they? From my connection with industrial development for nearly fifty years, I am doubtful whether present procedure under unbalanced conditions will bring us out of chaos that exists today. I personally believe that if, instead of sending every Tom, Dick and Harry to Washington who has had a political pull in their respective communities, we train our foremost citizens to become statesmen as they were in our early history, then a greater beneficial control of our loved country would ensue and future great industrial problems might be met and solved without the chaos that we now have to endure.

But I seem to forget that I came to preside at this twenty-third convention and not to discuss our national politics. The numerals "twenty-three" are, as a rule, considered quite unlucky, but that is only in our imagination. "Twenty-three" means the greatest convention we have ever held and we shall see that this comes true.

I am mindful of the fact that this great Commonwealth of Connecticut is celebrating the Tri-centennial of its settlement three hundred years ago. We need the faith of our forefathers to hew our way through the wilderness of our adversity of today, and if we have a united courage to do so, we shall and our way back to prosperity. "Faith" is the greatest word in any language. It is the fundamental principle of all religion, the foundation of all business. May we again reassert our "faith" in this old Commonwealth and spread it to every corner of our great country? Then all will be well.

This great Commonwealth State did, and I believe still does stand foremost in our nation in the variety of its manufactured products. In my memory it has always been a leader and always will. As the citizenship of the nation grew in numbers from fifty millions or more fifty years ago to its present one hundred and twenty millions or more of today, industry required of necessity to spread out to keep step with the march of time, to meet the ever increasing demand of supply and demand, so her sons traveled westward and helped to build up the industrial Middle West, always first in the ranks of industry.

May this great Commonwealth of Connecticut long endure and others praise her as she journeys forth towards a greater heritage and may her citizens prosper is our earnest prayer.

More than fifty years ago, or on November 23, 1881, I first passed through this great industrial City of Bridgeport on my way to Birmingham, twelve miles from here, which is now a part of the old historic town of Derby. In later years I went to Ansonia. Half a century to our younger generation seems an eternity of time. What great changes have taken place in this great country of ours in fifty years, only those that have lived through them, and are now approaching the allotted three score and ten, can truly visualize how great America has become in that period. I have always had a warm spot in my heart for Bridgeport. I saw days of intense suffering here in 1886 after a visit to Europe and I have had pleasure here that balanced the suffering, and after all those years all is well.

Connecticut has always been preeminent in the art of electroplating. Its first introduction from England into the United States occurred in Hartford or Meriden, Connecticut in 1846, I believe, and "Rogers 1847" trade-mark for a superior silver plated flatware product still holds good at the present time. Through the years following, electroplating constantly increased and some of the greatest practical platers that ever stood beside a plating tank were born in the state. They were progenitors of the future electroplater and the electroplating industry in the United States and Canada. They have gone on to the great unknown and the work they accomplished stands as a monument to them in the electroplating industry.

Fifteen miles from here in Ansonia in 1890 I first conceived the idea of an organization to better the condition of the platers' chemical knowledge so that he would, in the years to follow, become an electrochemist electroplater. I was at that time employed by the Ansonia Brass & Copper Company, first as a helper for two years, and then I became foreman in charge of all their electroplating operations. Troubles occurred in the operations of the plating solutions even as they occur today. One of my great problems in 1890 was in the nickel plating of heavy copper sheets twenty-four by fifty-four inches in dimensions. These sheets were very highly polished on both sides, the greatest lustre possible was necessary in the final nickel plated sheets. They were used in Newark and Arlington, New Jersey, in the manufacture of polished sheet celluloid, so the finish on the copper sheets had to be as nearly perfect as possible. The

demand for these nickel plated copper sheets was not a continuous one; large orders would come to Ansonia at intervals and my problems therefore in nickel plating these sheets was also at intervals. They were plated in a heavily built tank at least twenty-six feet long, thirty inches wide, and sixty inches in depth.

No problems ever occurred in nickel plating hundreds of thousands of brass kerosene oil lamps and hundreds of thousands of brass clock cases, etc. However, the nickel plated sheets which developed the problem were to all our usual tests applied as nearly perfect as possible when they left the Brass Mill Division, even the edge trimmings would stand a bending test until they broke in parts without any signs of peeling. Quite frequently our customers complained that the sheets received would not withstand the high pressure and temperature required in the production of the celluloid sheets, the copper sheets almost always peeled in the center of the sheets. This meant quite a loss to my employers as the sheets were returned and had to be replaced. Eventually, I overcame the problem, which I finally decided was due to Hydrogen, by controlling the acidity with citric acid pH which was unknown in those days.

In the ending of my problem, my nickel was whiter, more adherent, and the cobalt that was always present in our cast anodes came over in the nickel deposit. I had the reputation of producing the whitest non-tarnishing nickel deposit known at the time and all due to the citrates of nickel and the impurity cobalt in the deposit. However, before I solved my problem I had Doctor George Grower, our chief metallurgist make an analysis of the solution referred to. We did not plate copper sheets in our other nickel plating solutions but maintained a number of nickel solutions for the other products. When I approached Dr. Grower upon the subject of analysis of the solutions, he said: "What the devil do you want an analysis for? Don't you know how to plate any more?" In response I said, "Can you determine by guess-work the component parts of all the alloys our company's customers send in for an estimate or to know the percentages of copper, zinc, tin, etc., they may contain?" He said, "Not accurately." "Well, there is my answer to the reason why I desire an analysis. I desire to know what changes have taken place in my nickel solution as compared with its original component parts." But the analysis

did not solve my problems, but it did tell me to look for other reasons and causes.

Hydrogen is always the devil in the nickel or other solutions when blistering or peeling results, providing every other procedure before plating is not the basic fault of non-adherence.

Years later, in 1909, the American Electro-Platers' Society had its birth in the old Hotel Astor on Broadway, New York City, opposite the present general post office. It was first known as the National Electro-Platers' Association of the United States and Canada. Its progress, as previously stated, was remarkable at that time considering all the secrecy that existed among platers. On April 5, 1913, the American Electro-chemical Society held a symposium on electroplating at Atlantic City, and the National Electro-Platers Association was invited to attend the symposium and many of its members did attend and entered heartily into the deliberations and discussions. I made an address after being introduced to the audience by Dr. Lash Miller, the Chairman, as the Founder of the Electro-Platers' Society and thrice its president, and in conclusion of my address I had this to say regarding the electroplaters of the future:

"Now, gentlemen, the successful electroplater of the future should emanate from your universities. He should receive his chemical, electrical and mechanical education there. In fact, when he graduates from your university, he should be not only a theoretical but practical electrochemist and electroplater. This will save much controversy in the future as to who is superior in electroplating, the man who has graduated as an electrochemist with laboratory practice only, or the man who has gained his knowledge by practical experience in producing commercial results.

"I know of several large concerns where electrochemists are employed, and indirectly they have supervision of the plating departments. This diversity of opinion creates considerable feeling with the practical man.

"The university man makes an effort to prove his value to his employers, and this is accomplished ofttimes to the disadvantage of the practical man in charge of the plating department, which creates a friction and ofttimes distrust. This problem can be readily solved in the future by training young men who anticipate following the art of electrodeposition of

metals as a vocation. Let their laboratory and chemical knowledge be supplemented with practical instruction in the deposition of metals upon a commercial scale; have a plating department in charge of the most experienced and practical man you can obtain, and when your graduates go forth from your university they will be equipped with essential knowledge to take charge of a plating establishment and produce commercial results that are essential in this age of competition."

Evidently my vision as I saw it in 1890, when I had the first analysis made of my nickel solutions, and then again with the ending of my address in 1913, was correct. Presumably there can be no other answer to our Society's future strength and welfare, our eyes must be opened to the fact that scientific control of plating solutions applies to the electroplater of the future as it does in the great industrial plants of today.

I have always desired the Society to grow in numbers and have advocated the admission to the Society of assistant foremen platers on several occasions, either as a separate division controlled by active members delegated to their proper control, or as active members with or without privilege of the ballot.

At the Toronto, Canada, convention I had this to say (and which was also published in *The Metal Industry*, July, 1928, page 303) regarding the future of the Society:

"And now to the future of the Society, its doors must be opened wider and still wider so all can enter its portals who are interested in its future welfare.

"The Society to grow must have a continual healthy addition to its membership list. We must all look to the future. As the years come and go the men who stood at the helm of the ship through its early history and sunshine will pass on towards the Great Unknown and they will not return.

"So at the next Annual Convention to be held in Detroit have all the constitutional amendments so arranged that they will be broad in their scope for the good of the Society. Admit electrochemists who have had chemical supervision of electroplating plants for three years or more as active members. Admit assistant foremen platers associate members who have held this position for three years and can be vouched for by the firm or the foreman plater with whom they are employed.

"The assistant foremen plater must eventually become the

foreman plater and it is to him in the future that we must look to carry on the work of the Society, if the active members of today desire the Society to continue on as a foreman platers' Society.

"Let us look towards the future, the past is nothing in the face of the stern today. And then if we have the foresight, the Society will grow and its leaders will reap the reward of a work well and faithfully accomplished."

The Relation *Between the* Manufacturer *and the* Plater

Address by
MR. A. P. MUNNING
of the
Hanson-Van Winkle-Munning Co.
Read at Bridgeport Convention 1935

IT was not so many years ago when the entire art of what we now term "plating" was shrouded in mystery. In fact, in some places it was secrecy to the point of alchemy. Those who ruled the plating room possessed knowledge handed down to them by tradition and rule-of-thumb, and those who were in charge of the plater, who bossed the plating room, felt that the relationship was rather one that was necessary and of a secret nature, and hence not to be interfered with by the ordinary rules of business.

The plater was a necessary cog in the turning out of the manufacturer's goods, but the reason for his being there was necessity and to make the base articles manufactured look better, but not for any utilitarian purposes, and the manufacturer, considering this an added expense, looked upon the plating room more as an expense account than as a business producer.

With the advent of your Society and the greater knowledge of chemistry, this situation began to change, very gradually at first. Foremen platers gathered to talk over and take out of their art the mystery which chemistry showed was all reducible to certain formulae and rules. They even went so far, at first timidly, to invite manufacturers to their meetings, in order to convince them that they were working to master an art, rather than to improve their own positions.

Why, I can remember thirty years ago when simple formulae were sold by platers, one to another, and to manufacturers, for $5 and $10 per formula, and when the art of making a black nickel finish was considered almost equal to producing a masterpiece in oil. How all of this has changed, and from what was considered a blind, mysterious procedure we have evolved into a science and art which has grown so steadily that it is not only useful and ornamental, but absolutely necessary in our modern day commercial activity.

As I see it, the art of electroplating, or of electrolytic covering, embraces three distinct scientific sequences:

1. *Chemical*
2. *Electrical*
3. *Mechanical*

and the knowledge of these three is essential in forming a practical and also a theoretical viewpoint to give us the beautiful results we are obtaining today. Commercial activity in many lines would be retarded and many articles would not be as efficiently made, or as ornamental, if it were not for the scientific knowledge and the practical knowledge which we have all learned regarding the combination of these three, and the sequences which must be carried on before the plater is able to please his manufacturer.

A forward and farsighted step made was the formation of the American Electro-Platers' Society, but a greater one was the establishment of your Research Committee and the arrangement for the collaboration of that Committee with the Bureau of Standards at Washington, D. C., and later with your cooperation with The American Society for Testing Materials, for the correct answers to many of your problems.

Here was an opportunity, not only for the manufacturer to help and contribute to an art in which his plating foreman, or department, obtained not only the cooperation of his plater but also unbiased, authentic and official advice to substantiate in most cases the opinion of his own people.

This cooperation broadened materially the human relationship between the manufacturer and plater, and has contributed largely to the prestige and building up of the plating department and the men in it from a scientific, mechanical and chemical

point of view. In other words, what was formerly considered as of a minor or nuisance value became a real department of consequence, where skill and ability and scientific knowledge made the manufacturer's products not only durable and beautiful, but saleable for their utilitarian, attractive and resisting qualities.

Then came the big improvement in plating practice, processes, plating machinery, chemicals and chemical adaptations, which so universally increased the art of plating or covering that it became necessary to define standards of measurements for thickness, for coating and many other details. This work of defining standards makes your art definite and places you on a par with many of the other scientific arts where definite rules or standards govern future progress. It makes the manufacturer conscious that he must have the proper men and the proper tools to work with, and it places the responsibility on the man in charge of the plating room to consult with his manufacturer and obtain the correct and necessary equipment and tools and products to bring his art up to the required high standard, or even higher standards that may be justified.

So we see today the modern plating room, with its automatic machines, its laboratory department as an adjunct to determine good materials and quality of output; its production turned out on a scale undreamed of only twenty-five years ago; its men with a technique unbelievable ten years ago; and their vision broadened so that we can safely say that we are founded on a firm foundation.

We may also point out that today every representative manufacturer of plating products offers to the manufacturer of plated or coated material, and his plating foreman or department, an up-to-the-minute scientific service and comprehensive, reliable, commercial data which was entirely lacking in the early stages of the art.

With such an evolution, and may I say revolution, in the few years that have passed, what of the future? Isn't it possible to feel that the manufacturer will some day consider this the most important part of his production, for it involves a science which, in addition to making his articles saleable, makes them beautiful and attractive and of lasting benefit?

Where does the plater come in in this relationship? Isn't he going to be recognized more and more, and must he not keep

abreast of the times and be conversant with not only the practical but scientific knowledge of his art? It was Francis Bacon, the first English philospher, who said, "Crafty men condemn studies, simple men admire them, and wise men use them", and this truth is just as important today as it was when first spoken in 1592.

These remarks are intended simply to broaden our thoughts on the industry and for the industry, and to stimulate the good will which formerly did not exist, but now does exist, between all good manufacturers of plated, or coated products and their respective foremen platers, chemists, and so forth. "Knowledge is Power", and every good manufacturer recognizes the man who knows his stuff and his department, so that phase of the question is left out of consideration because it takes care of itself as in all well regulated families.

To be helpful, not only in our own sphere but in the relation between the plating department and other departments, to keep within our own ideals, help others to progress in theirs by what we can teach them, helping the man and the concern you are working for by what you can contribute to their prestige and profits, these are all matters which are so self-evident that it is useless to dwell upon them at this time.

There is one parting thought which I have had in mind for a long time, and that is the term which is used to designate the man in charge of the plating-room. I do not think that the words "Foreman Plater" are out-moded by this time. I do think it is an outlandish term which can be supplemented by a much better synonym. I have often thought that this department, which is such a broad one today that it covers not only cleaning, preparation, polishing, plating and buffing, can be given an all-embracing term, and that the man in charge of it can be given an all-embracing title. The title of "Supervisor of Finishing Departments" is now often used. Far be it from me to designate what this should be, but it is well worthy of your consideration.

Finally, in the twenty-five years of labor which I have put into this field, it has been gratifying to see its advance and to help stimulate its growth, and so long as it is humanly possible, my heart and my thoughts will be towards the better progress of the entire art and the men in it. (Applause)

Address by the

Hon. Jasper J. McLevy

Mayor of Bridgeport

Mr. President and Delegates to the Electro-Platers' Convention: It certainly gives me the greatest pleasure to have this opportunity of welcoming you to the city of Bridgeport today. I am sure that Bridgeport is proud to have within its midst a group of men and women who are so essential to the development of the industrial life of not only our community but of the United States as well.

I feel that at the present time the holding of conventions of this nature, the talking over of common problems by the men who are engaged in the life of the nation, is one of the best omens for a speedy recovery from the depression that has prevailed for the past number of years. I have had the privilege of talking to quite a number of groups like this during the past few months, and I find an entirely new spirit permeating the entire fabric of our nation. The old spirit that seemed to take on an atmosphere of being licked has rapidly passed away, and now the groups are meeting with a determination to tackle the job that is before them and to solve it in a practical manner for the welfare not only of their own particular groups and organizations, but for the benefit of the nation as a whole. I know that with that spirit we are bound to conquer and surmount the worst obstacles that stand in our path.

I am sure this group of men who are gathered before me today are going to tackle the problem that lies before them in just such a manner. I know that Bridgeport is proud of the group of men in this city who are engaged in your line of business, and I feel that as time goes on, they are going to play a more important part in its development. Of course, there is great room for

improvement, not only in your line but in every other line, but at the same time as we meet our problems day by day and solve them, we are marching on to a stronger organization, both industrially, economically and socially.

It gives me great pleasure, in conclusion, to welcome you to the city of Bridgeport. Bridgeport is indeed honored by having you here today. I am sure that after you have worked upon your own problems and then have taken the time to look over the many things that Bridgeport has to offer you — our institutions and our parks — you will go back home feeling well repaid for your visit to our community. I am sure that Bridgeport will be only too happy to welcome you back at some future time.

I hope you will leave our city with fond remembrances of the associations you have made and also of the things you have learned while in our midst. Again I want to congratulate you and wish you all the success in the world in your deliberations here today.

I might say, so far as Bridgeport is concerned, that it always extends its hospitality to all its visitors within its midst. You do not need a key. You are welcome to everything that we have, and we certainly hope you will take full advantage of that. (Applause)

APPOINTMENTS

President T. F. Slattery has made the following appointments:

Mr. Wm. Phillips has been reappointed Chairman of the Research Committee.

First Vice-President Mr. Joseph Underwood is reappointed Chairman of the Membership Committee.

Second Vice-President, Mr. Patrick J. Sheehan, will act as Chairman of the Program and Educational Committee and will also have supervision of the Abstract Section. The other members of these Committees will be announced later.

Black Nickel

By JOSEPH L. DOWNES
REMINGTON-RAND, INC.
Middletown Plant
Middletown, Conn.
Read at Bridgeport 1935 Convention

THE electrodeposition of Black Nickel and the character of the deposit seems to be little understood. The prevailing opinion is that the deposit has similar characteristics as that of a white nickel deposit. It is also assumed that black nickel coating has a rust-proofing property. In order that there will be a little understanding of this electrolytic coating, it was thought that a paper on this subject would be of interest to the members of the A.E.S.

The history is not clear. There was issued to a Mr. C. Bates in 1886, a patent on what is now called black nickel. The first publication of the solution now in general use was given in the "Brass World" in 1904. The formula recommended is as follows:

Nickel Ammonium Sulphate	8 oz.
Zinc Sulphate	1 "
Sodium Sulphocyanate	2 "
Water	1 gal.

We do not know of any material change in the composition of this solution except that made at our plant. It was desired to obtain a heavier and harder deposit as the object to be plated was subjected to considerable wear. The formula decided upon and which has been in use in a 2500 gallon semi-automatic plating machine for more than five years is:

Nickel Sulphate	10 oz.
Nickel Ammonium Sulphate	6 "
Zinc Sulphate	5 "
Sodium Sulpho Cyanate	2 "
Water	1 gal.

Before going into the details of the operation of these solutions, a brief summary of the development of methods for obtaining similar results will probably be of interest. The one that received the most attention, especially during the period of the

World War, would not be given much consideration today when the aim of the electroplater is to operate solutions as simple in construction as it is possible to make them. This permits the control of the several constituents in the solution by chemical analysis. Such a control would be most difficult if not entirely impossible in the Rock Island Arsenal Black Nickel. This you can judge for yourself. The formula given was in two parts and each part divided into separate solutions all of which was to be mixed and used, may I say — if you were expert in waving a magician's wand and obtaining the desired results.

Part 1.

1.	Nickel Ammonium Sulphate	6 lbs.
	Water	6 gal.
2.	Sulphuric Acid	4 oz.
3.	Phosphoric Zinc	1 lb.

(Note) Phosphoric Zinc is made by adding 8 oz. of metallic zinc to 1 pint of phosphoric acid which has been diluted with 1 pint of distilled water.
This should stand at least 12 hours before using.

4.	Ammonium Carbonate	5 lbs.
	To be added slowly with care.	
5.	Sodium Cyanide	¾ lbs.

Part 2.

Arsenous Acid	10 lbs.
Sodium Hydroxide	10 "

Add Part # 1 and Part # 2 together and sufficient water to make 12 gallons.
What a job to make 2500 gallons!

Two other solutions received several trials but these seem to have not proven as good as was expected; still they have some merit. The first was published in 1919:

Nickel Phosphate	8¼ oz.
Sodium Pyrophosphate	26¼ "
Water	3 gal.

In 1921 Haas suggested the following formula:

Nickel Ammonium Sulphate	12 oz.
Zinc Sulphate	½ "
Sodium Sulphate	2 "
Rochelle Salts	½ "
Water	1 gal.

The present solutions give deposits that are mostly ornamental, that is, a black color for a final finish. There is, however, a modification of the composition of black nickel solutions from which a "smut" can be had. This is useful in producing a black color in recesses of work as it can be easily relieved giving what is commonly called a French Grey effect. This is especially useful for flat-ware such as spoons, fork and knife handles and for novelty work. Such a solution can be made of:

Nickel Ammonuim Sulphate	15 oz.
Copper Sulphate	5 "
Sodium Chloride	6 lbs.
Aqua Ammonia 26 degree Beaume	18 oz.
Water	3 gal.

The standard solution and I think we are justified in calling it such, as it has stood the test of both the skilled engineer and the old time plater, gives a deposit that is essentially different from a metal deposit obtained from any other solution used in electroplating. From a nickel, copper, brass, silver or gold solution, the deposit is 100% metal. From a Black Nickel solution the deposit is not all metal. It is a composite deposit of nickel and zinc combined with sulphur and in all probability wirh oxides, although the latter has not been, to my knowledge definitely determined. The total metal content of a satisfactory black nickel deposit averages about 60%. Just what the balance is no one has taken the trouble to find out and it is suggested that this would be an interesting investigation for some research student in electrochemistry who wishes an unknown problem for the basis of a thesis. The partial analysis of a good black nickel coating is:

Nickel	52.00
Zinc	7.50
Sulphur	14.00

From a study of the analysis of the solution and the deposit obtained when the proportion of the ingredients varied, it was found that the most important factor in producing acceptable deposits that had both appearance and good wearing surface is

the sulphur content. The results have been so consistent that it is possible to make a definite statement, that is, when the sulphur is low in the solution, the nickel in the deposit is low and the zinc is high. This is borne out by the amount of sulphur found in the deposit. For comparison the assay of two characteristic deposits is given:

	Poor	*Good*
Nickel	40%	52.0
Zinc	10%	7.5
Sulphur	7%	14.0

It has also been noted that when the sulphur content of the deposit is high, the total metal is also high, e.g., with the sulphur at 14% the total metal content was 60%; while with sulphur only 7% the total metal was only 50%. From this data it is evident that to obtain consistently good deposits from black nickel solutions that control the sulphur content is of equal, if not greater importance than that of either the nickel or the zinc. Our observation has been that either the nickel or zinc concentration has a wider range of variability than that of the sulphur, as even when these are not in the same ratio relation as in a correct solution, the deposit has a satisfactory appearance. We do not mean to infer that it is not necessary to control the metal content of this solution; it is more essential than to control solution that deposits 100% metal coatings. The methods have been published which makes it unnecessary to restate them in this paper. It can be stated that my experience is that the methods suggested are easy to follow and sufficiently accurate to maintain the solution in a condition from which consistently good work can be obtained.

As the deposit is not what may be termed a true alloy, and, as there are sulphides and probably oxides prese t, it is evident that its physical characteristics are entirely different from a true alloy. The deposit is not continuous, that is, if it should peel from the basis metal it will not be in a sheet but be very brittle and have the appearance of a fine grained powder rather than of an electrodeposited metal coating.

The black nickel coating is not rust proof. Due to its physical construction as noted, it can be expected that it will be porous.

Not being a continuous coating it does not seal up the basis metal. While zinc does offer protection against corrosion, it does not follow that a zinc-nickel alloy will also act in the same manner and less so with the inclusions of sulphides and oxides.

To obtain the best finish both from the point of appearance and wear, it is advisable to plate black nickel over a substantial deposit of nickel. Black nickel should not be plated directly on steel. It can be plated directly on brass when the object of plating is to obtain a certain finish — that is, a bright jet black or a steel grey.

In operating the solution, attention must be given to the anodes. If nickel or zinc anodes are used they will soon become coated over with sludge and necessitate the use of such a high pressure that nickel will be deposited in preference to zinc causing whitish streaks in the deposit. We have successfully used hard gas carbon anodes. They do not coat over and therefore while a higher pressure is necessary than would be if a soluble anode was used, which is not possible in this solution, there is always a flow of current so that a uniform distribution is had over the surface of the work which results in a uniform color. Carbon anodes, up to 100% of the total anode area can be used, in fact, when the surface area of the anodes is much greater than that of the cathode the required current density can be had at a pressure where the nickel, zinc and sulphur is deposited in the ratio that insures the desired characteristics of the deposit.

We have found that from 65 to 78 degree Fahr. is the desirable range. Below 65 degree current distribution is not good and beyond 78 degree the solution has a tendency to run more to the lighter or gunmetal color.

All of our black nickel is being done with moving cathodes which travel approximately from 20 to 25 inches per minute.

Voltage—we have found the most desirable voltage to be from $1\frac{1}{2}$ to 2 across the tank rods; anything beyond that has a tendency to burn and give gray deposits.

Amperes—1 to 1½ per square foot—results beyond that are not as good.

P. H.—All of our P.H. readings are taken with the colormetric sets—from 6.6 to 6.8 is the most desirable. When our P.H. goes lower such as to 6, the color is light and the deposit will be more soft.

In a 2500 gallon solution, the P.H. condition we have found must be adjusted daily.

While it is admitted that there are few new things under the sun we are pleased to have had this opportunity of presenting our experience with the so little understood Black Nickel.

DISCUSSION

CHAIRMAN CHAMBERLAIN: Are there any questions, gentlemen?

MR. W. H. FLAHERTY (Excelsior Hardware Co., Stamford, Conn.): What is the difference in the productive costs of the black nickel solution and the oxidized copper solution?

MR. DOWNES: It would be approximately twice as much, because we must have the white nickel under the black.

MR. FLAHERTY: How is your upkeep of that solution as compared with that of an oxidized copper solution?

MR. DOWNES: We find the upkeep is not so expensive. The sulphur is very slow to pass out of the solution and the metal likewise, but the zinc requires about once a week in that 2,500-gallon solution. We use from ten to fifteen pounds of zinc sulphate per week.

MR. FLAHERTY: In small parts, would that be satisfactory to put in barrels?

MR. DOWNES: Yes; we use that daily in barrels.

The Effect of Various Acids *on* Cold Rolled Steel

By E. T. CANDEE

Read at Bridgeport 1935 Convention

THIS investigation was part of a study of various factors affecting the quality of electro-galvanizing on steel. It was necessary to furnish a surface for galvanizing which would afford perfect adherence of the deposit and at the same time not impair the physical properties of the base metal. The strip is continuously galvanized, allowing only a very short exposure to any solution. At the same time no solution can be used which would damage the steel in a fifteen-minute immersion. Such an immersion would occur with temporary shutdowns. The steel must also enter the galvanizing solution substantially free of oxide films which might impair the adhesion of the deposit.

In etching the surface of steel with acid sufficiently to produce a good bond, there is always the danger of adsorption of hydrogen known as acid brittleness or hydrogen brittleness. The work on hydrogen brittleness was conducted on a Low Carbon Steel of the following analysis:

Carbon	.12%
Manganese	.44%
Silicon	.11%
Phosphorus	.009%
Sulphur	.006%
Copper	.09%

The steel was cold rolled to the final size and continuously normalized. It had the following physical properties:

Tensile Strength	62,500# per sq. in.
Elongation in 2"	28.5%

The steel was pickled and oiled by the Steel Mill. The scale produced by continuous normalizing is so slight that any embrittlement produced was ignored. The steel was stored four months between the time of pickling and the work of this investigation. The metal used was 17/32" x .020" and had hard edges from continuous slitting after normalizing.

The Amsler Bend Tester was used to determine the loss of ductility of the steel due to hydrogen embrittlement. The

sample tested was 6″ to 8″ long and was tested on a 6Kg load over #2 jaws with a radius of .078″. The bends to failure were determined by bending the sample 90° and return—count 1; bend 90° in the opposite direction and return,—count 2; and continue until the sample shows cracks on the bend. The bending was conducted at one bend per second. When there was doubt whether the sample had cracked or the grain had "opened up" the sample was examined with a 10-X magnifying glass. The appearance of cracks was taken as the point of failure rather than the actual fracture into two pieces as the results were more consistent. Very often after 90% of the width of the strip had broken, the remaining 10% would require three to four bends before parting.

Samples to be pickled were washed with a mixture of carbon tetrachloride and benzine and dried. Twelve samples were pickled simultaneously for the required length of time, quickly washed in cold water and wiped dry. At no time during washing, drying or storing were the samples raised above room temperature. The samples were stored at 70° F. in the laboratory office.

The solutions used for the pickling tests were made up of various concentrations of acid, using distilled water and CP acids. No attempt was made to use acids especially free from arsenic or other impurities which might catalyze the adsorption of hydrogen as, in practice, commercial acids are used which would contain even more of these impurities than the CP acids used for the investigation.

The samples were pickled in hydrochloric, sulphuric and nitric acids in concentrations of 3%, 5% and 10% by weight. The pickling was conducted for one-two-five and ten minute periods, at 70° and 140° F., with each of the above concentrations of each acid. A patented electrolytic bright dip was also included. This dip was used under the recommended conditions of sulphuric acid, 40° Baumé, 80° F., 100 amps. per square foot. Of the twelve samples pickled, four were tested immediately, four were tested after storing twenty-four hours, and four were tested after storing seven days. The results of these tests are given in Tables #1 to #4. All figures are the average of four tests. Individual bend values did not vary from the figures given in the table by more than 1½ bends. The increase in

bends to failure in some cases is probably due to a thinning of the metal as the number of bends to failure of samples of the same ductility increase with a decrease in thickness. The figures given for samples pickled in hot solutions for fifteen minutes do not give an accurate picture of the embrittlement for the same reason.

EXAMINATION OF PICKLED METAL FOR OXIDE FILMS

It is recognized that metal which is to be plated must be substantially free of oxide films. Examination was made for these films with $\frac{M}{20}$ copper nitrate according to the method of U. R. Evans. A separate set of samples were tested for these films by allowing a drop of the copper nitrate solution to remain on the metal for one minute. The samples were tested at intervals of two seconds to fifteen minutes after pickling to detect the presence of films on the metal and to determine the rapidity with which they were repaired. In some cases bright metallic copper was deposited. This was considered as an indication of no oxide film. In some cases dark brown copper was deposited. This was considered as a discontinuous oxide film. In some cases no deposit was formed; an indication of a continuous oxide film.

DISCUSSION ON RESULTS

SULPHURIC ACID

(See Table I, Page 29)

Although it was found that the unpickled material averaged 24.5 bends to failure, this being the a erage of twelve tests, in many cases it was found that the metal had greater ductility after a short pickle than the unpickled metal. Whether this is due to thinning of the metal, which seems improbable from the short time of pickling, or whether it is due to removal of a thin film of worked material at the surface, the effect of which may not be removed in continuous normalizing, cannot be definitely stated. From a study of all of the results, the latter seems to be the more logical conclusion. It should be understood that this metal is rolled from the hot rolled sizes of .060" to .080" down to the final size, without an intermediate anneal, and the metal is not rolled after the final normalizing.

Three per cent sulphuric acid, cold, slightly embrittled steel, although there does not seem to be any increase in embrittlement when pickled fifteen minutes. The same concentration of acid when used at 140° F., in most cases gives slightly greater embrittlement, but in no case is the amount of embrittlement considered serious enough to damage the properties of the metal. After seven days' storage most of the ductility was returned, although in no case did the bends reach the value of the unpickled steel.

Five per cent sulphuric acid, cold, does not embrittle the metal more seriously than three per cent sulphuric acid, even with a fifteen minute pickle. In some cases, there is actually an increase of ductility over the original sample, which may be due to the cause mentioned above. Five per cent sulphuric acid at 140° F. begins to embrittle the metal in two minutes, and seriously impairs the ductility in fifteen minutes. However, after storing the metal for seven days, the ductility is returned to its original values, and in most cases is greater than that of the unpickled metal.

Ten per cent sulphuric acid at 70° F. does not embrittle the steel as much as three per cent sulphuric acid, and after storage of samples for seven days the ductility is greater than those pickled in three per cent sulphuric acid under the same conditions. Ten per cent sulphuric acid at 140° F. begins to embrittle the steel in two minutes, and in five minutes enough hydrogen is adsorbed to impair seriously the properties of the metal. After storing the metal for seven days, the original ductility is returned in all cases.

HYDROCHLORIC ACID

(See Table II, Page 30)

Three per cent hydrochloric acid at room temperature does not embrittle the steel until it has been immersed for fifteen minutes, and even then the embrittlement is very slight. After storing of the samples for seven days, the original ductility is returned, and in all cases the steel is more ductile than the unpickled metal. Three per cent hydrochloric acid at 140° slightly embrittled the metal in one minute, and seriously in two minutes. After storage seven days, the ductility of the samples pickled

one and two minutes is recovered. The samples pickled five and fifteen minutes have not completely recovered.

Five per cent hydrochloric acid at 70° F. does not embrittle the steel in two minutes, and only slightly in fifteen minutes. In all cases, the ductility is greater after seven days' storage than the unpickled steel. Five per cent hydrochloric acid at 140° F. begins to embrittle the metal in one minute and embrittles it seriously in two minutes. The ductility is recovered in the samples pickled one and two minutes, but not in those pickled five minutes and over.

Ten per cent hydrochloric acid at room temperature impairs the ductility in two minutes and makes the metal worthless in fifteen minutes. In all cases, the ductility is recovered after seven days' storage. Ten per cent hydrochloric acid at 140° F. embrittles the steel in one minute, but in all periods that the metal was pickled practically all of the ductility was recovered in seven days. This is contrary to the results found with the more dilute acids used at the same temperature.

NITRIC ACID

(See Table III, Page 30)

Three per cent nitric acid at 70° F. does not embrittle the steel even in fifteen minutes. In samples pickled one, two and five minutes there is a slight increase of ductility when the samples are stored seven days, although this brings the ductility to a greater value than the unpickled metal. Three per cent nitric acid at 140° F. actually increases the ductility of the metal when pickled as long as five minutes. There is no increase of ductility on storing. In the case of samples pickled in hot nitric acid solution, it was not possible to pickle them for fifteen minutes with dilute acids or as long as two minutes with the stronger acids because the action is so rapid that the metal was thinned to .010″ in some cases, and in other cases was completely dissolved.

Five per cent nitric acid at room temperature does not increase the ductility of the steel, although in some cases the ductility increases on storing. Five per cent nitric acid at 140° F. does not embrittle the steel and no increase in ductility is found on storing seven days.

Ten per cent nitric acid at 70° F. does not embrittle the steel

in any concentration used. When the steel was pickled five minutes, the ductility values increased considerably. In this case, it was probably due to the thinning of the metal, and not due to any change in the properties. Ten per cent nitric acid at 140° F. used for one minute does not increase the ductility of the metal, although on storing for seven days the ductility increased. Whether this increase on storing is due to a liberation of hydrogen or some other factor is not understood.

ELECTROLYTIC BRIGHT DIP

(See Table IV, Page 31)

The Electrolytic Bright Dip, using 40° Baumé sulphuric acid at 80° F., the metal being used as anode at current density of 100 amps. per square foot, did not show embrittlement up to a fifteen minute pickle and did not show any increase in ductility on storing.

OXIDE FILMS

All samples pickled in hydrochloric acid except the one pickled one minute at 3% HCl at 70° F. showed a bright copper deposit when tested with $\frac{M}{20}$ Cu NO_3. The samples after pickling and washing could stand four minutes without change in the character of the copper deposit. Samples held in the air wet for five minutes and longer showed a dark brown deposit of copper.

Sulphuric acid under all conditions gave a dark brown film of copper. There did not seem to be any difference in the color of the deposit with different conditions of pickling.

Nitric acid produced a film which could not be penetrated by the copper nitrate solution. It required a two-minute pickle in 5% H_2SO_4 to deposit dark brown copper, and a five-minute pickle in 5% HCl to deposit bright copper.

Steel pickled in the Electrolytic Bright Dip gave a dark brown deposit when tested with copper nitrate.

It was determined by practical demonstration that any steel which gave a bright or dark deposit with copper nitrate could be plated so that it could receive severe forming without loosening the galvanizing from the base metal.

CONCLUSIONS

Sulphuric acid may be used in concentrations up to 10% at 70° F. for fifteen minutes without impairing the ductility of low carbon cold rolled steel. At 140° F. 3% sulphuric acid begins to

embrittle the steel seriously within five minutes, while 5% and 10% sulphuric acid begins to embrittle steel within two minutes.

Three per cent and 5% hydrochloric acid may be used at 70° F. for 15 minutes without seriously decreasing the ductility of the steel. Ten per cent hydrochloric acid at 70° F. begins to decrease the ductility when pickled over five minutes. The ductility of the steel will be impaired if left in hydrochloric acid pickle at 140° F. in the concentrations used for more than one minute.

The Electrolytic Bright Dip may be used as long as fifteen minutes without any damage to the steel.

Nitric acid in any of the concentrations used, hot or cold, does not decrease the ductility of the steel. In all cases the ductility is greater after seven days' storage than that of the original metal.

Nitric acid leaves a very heavy oxide film on the metal which does not furnish a proper base for plating. Hydrochloric acid alone will remove the oxide film put on the steel by nitric acid. The other pickles themselves do not leave this film. (Applause)

EFFECT OF VARIOUS ACIDS ON COLD ROLLED STEEL

Number of 90° Bends to Failure

TABLE I

SULPHURIC ACID

Time of Storage after Pickling	Pickled 70°F.	1 min. 140°F.	Pickled 70°F	2 min. 140°F.	Pickled 70°F.	5 min. 140°F.	Pickled 70°F.	15 min. 140°F.
3% H_2SO_4								
Tested immediately	22.0	22.8	23.0	21.2	22.5	21.0	23.2	22.2
1 Day	23.2	23.2	24.8	22.5	23.5	21.5	23.5	23.2
7 Days	24.0	24.0	24.0	24.0	24.0	23.5	23.5	23.8
5% H_2SO_4								
Tested immediately	25.0	25.5	24.2	22.2	24.5	21.5	23.5	19.0
1 Day	24.5	25.8	22.8	26.2	25.0	20.5	23.5	21.0
7 Days	24.0	26.0	24.5	25.5	24.5	25.5	23.5	25.5
10% H_2SO_4								
Tested immediately	26.5	24.0	25.2	22.2	24.2	16.2	24.0	18.0
1 Day	26.5	25.0	26.0	24.2	27.0	21.5	27.5	24.2
7 Days	25.5	26.5	25.5	25.0	25.0	24.5	25.5	25.0

Ductility of Unpickled Steel 24.5 Bends (Average of 12 tests)

EFFECT OF VARIOUS ACIDS ON COLD ROLLED STEEL

Number of 90° Bends to Failure

TABLE II

HYDROCHLORIC ACID

3% HCl

Time of Storage after Pickling	Pickled 70°F.	1 min. 140°F.	Pickled 70°F	2 min. 140°F.	Pickled 70°F.	5 min. 140°F.	Pickled 70°F.	15 min. 140°F.
Tested immediately	26.0	23.5	25.5	19.5	26.5	17.0	23.5	10.2
1 Day	26.0	25.5	25.5	25.0	25.5	17.5	25.5	12.0
7 Days	26.0	26.0	26.0	26.0	25.0	25.0	26.0	20.5

5% HCl

Tested immediately	26.2	22.5	27.2	19.5	25.5	16.0	23.0	10.0
1 Day	26.0	24.5	26.8	22.0	26.8	20.5	26.5	11.0
7 Days	26.0	26.0	26.5	26.0	26.0	25.0	26.2	23.0

10% HCl

Tested immediately	24.5	21.0	27.0	16.0	22.5	14.5	16.5	11.0
1 Day	24.8	23.5	26.5	22.5	25.0	17.5	22.0	17.8
7 Days	26.0	26.0	26.2	25.5	26.5	24.5	25.0	24.2

Ductility of Unpickled Steel. 24.5 Bends (Average of 12 Tests)

EFFECT OF VARIOUS ACIDS ON COLD ROLLED STEEL

Number of 90° Bends to Failure

TABLE III

NITRIC ACID

3% HNO_3

Time of Storage After Pickling	Pickled 70°F.	1 min. 140°F.	Pickled 70°F.	2 min. 140°F.	Pickled 70°F.	5 min. 140°F.	Pickled 70°F.	15 min. 140°F.
Tested immediately	24.8	26.5	25.0	26.2	24.0	27.2	28.0	
1 Day	26.5	26.0	26.0	26.0	25.0	26.5	26.5	
7 Days	26.0	26.0	26.0	25.5	26.0	26.5	26.0	

5% HNO_3

Tested immediately	25.0	26.0	24.2	26.0	26.5	26.2	26.0
1 Day	26.5	25.2	26.0	26.0	24.5	25.2	25.5
7 Days	26.0	26.5	24.5	26.0	24.5	26.5	25.5

10% HNO_3

Tested immediately	25.2	27.0	25.5	28.5
1 Day	26.5	28.5	27.2	28.2
7 Days	26.5	29.0	26.0	27.0

Ductility of Unpickled Steel. 24.5 Bends (Average of 12 Tests)

EFFECT OF VARIOUS ACIDS ON COLD ROLLED STEEL

Number of 90° Bends to Failure

TABLE IV

Sulphuric Acid 40° Baumé
Temperature 80° Fahrenheit
Current Density 100 a/sq. ft.

ELECTROLYTIC BRIGHT DIP

Time of Storage after Pickling	Pickled 1 min.	Pickled 2 min.	Pickled 5 min.	Pickled 15 min.
Tested immediately	25.5	26.0	26.5	25.8
1 Day	26.2	25.2	25.8	26.2
7 Days	26.0	25.8	25.5	25.8

Ductility of Unpickled Steel. 24.5 Bends (Average of 12 Tests)

DISCUSSION

CHAIRMAN PHILLIPS: The paper is now open for discussion.

MR. STRAUSSER: Mr. Candee, in your study of the various types of pickles, did you include the use of inhibitors, and, if so, wouldn't that reduce some of this hydrogen embrittlement which we assume was the cause of breakdown?

MR. CANDEE: We did not include any inhibitors at all, because we did not feel they were anything we wanted to use. We were very much afraid there would be some of the inhibitor adsorbed on the surface of the metal, which would do away with all the value of our pickle. So in these tests we use a standard chemically pure acid. We made no attempt to get rid of arsenic, because in practice we use technical grade materials.

MR. EDWIN M. BAKER (University of Michigan, Ann Arbor, Mich.): It occurred to me that there are really two effects that may be created in the results. The effect of pickling might be to round out cracks which were in the surface of the metal, very small cracks, it is true, and, therefore, increase the ductility. Thus, for example, it has been shown that if you take a large piece of rock salt and carefully cut from that a number of right cubes and test part of them in the air and part of them under water, those which are tested under water will show much higher crushing strength, due to dissolving away the sharp edges of cracks. Then superimposed on that would be hydrogen embrittlement. That might account for those results which you found showing greater ductility in the pickled metal than you had at the start, and the effect where the strength would go down, perhaps, and then come up might be lowered because of hydrogen embrittlement, and then later raised because of

crack elimination, the rounding of cracks. Whether or not that is the actual case, I do not know; it is a theoretical possibility.

There is one other thing that I might add. Some years ago I had occasion to make some check-ups on the so-called Madsen process of electrolytic pickling preceding plating for adherence. These particular tests were run with plating on so-called blue sheet, which was first pickled in a hot pickle. I do not remember its exact composition, but I believe it would be about a ten per cent sulphuric acid. Then half of the sheets, after pickling were made to anode in about sixty-six degree Baumé sulphuric acid at room temperature until current substantially did not flow any longer. They were then nickel plated in the bath that could be described for the moment, fairly accurately, as the Watts bath. The other pieces were simply rinsed in water and then plated. We tried to determine some difference in the degree of adherence of the nickel, and in all cases the nickel was found to adhere so firmly that we could not find any method of arriving at a difference, but among the methods tried was to take pieces cut from these two sheets, that is, cut from the two sets of sheets so that we had duplicate samples from each of several sheets, and run those in an oscillating or a break-down test on a fatigue machine, where the degree of flexing was less than that corresponding to the elastic limit. In both cases the metal finally broke. We found no degree of difference in the adherence, but those pieces that had been given the electrolytic treatment took about twenty per cent more oscillations to break than the pieces that had not been given it, showing there the elimination, probably, of hydrogen as a result of having these so strongly anodic for a considerable period of time.

MR. CANDEE: I might describe how this steel is produced. It is rolled from about eighty-thousandths to twenty-thousandths without any intermediate anneals. It is given a continuous normalizing and then it is given a very quick pickle. All this is done at the steel mill. We have nothing to do with that. It is not given any working whatsoever after annealing, which is ordinarily considered the cause of a lot of the difficulties in plating.

DELEGATE GEHLING: I am taking it for granted that these experiments were made on sheet steel. I presume they were made on hot rolled steel. In one of those curves, Mr. Candee

showed where a three per cent nitric acid solution left a brown film on the samples. How long would it have to be in there to get that film? Would that be momentary? The reason I ask that is because it is a little over twenty-five years ago when it was common practice to take that metal and give it a sulphuric acid pickle first and then dip that stuff in pure nitric acid, room temperature. When you first pickled it in nitric acid at room temperature you had no film, but if you run that pickle for eight or ten hours, when the solution becomes impregnated with nitrate of iron, which was actually deposited or would be left as a film on the steel, it was necessary to take it at that part of the day and stick it in a fifty per cent muriatic pickle, which would immediately take it off. That procedure was followed at that time to acid zinc plate this sheet steel.

We did not have to get so technical to find out how much it would bend, but they were bent up into condulet boxes that you will find in the subways, and it had to be cleaned that way to get a quick and heavy adherent deposit of zinc. That stuff was bent up in those boxes after it was deposited. I do not know whether this is a more economical method that you are explaining, but that was the most economical method we could find, and it was the simplest and the quickest because it was momentary. When you took it out of the nitric acid it was a silver white color and you could immediately deposit the acid zinc on there. We had no loss. We never lost any of the production because of deposits peeling or because the ductility of the metal was injured in any way whatsoever.

MR. CANDEE: As to the steel being cold or hot rolled, as I said, it is hot rolled and then cold rolled down. It is a true cold rolled steel. When you speak about your nitric acid dip, I believe it is stronger than what we use. We use ten per cent and you used, I understand, strong nitric acid which would make the steel passive and bright. We actually wanted to etch the surface, and we wanted it to dissolve. In three per cent nitric acid, we got relatively little darkening in a five-minute pickle at room temperature. At room temperature in ten per cent nitric acid, it got pretty brown and dark within a minute, enough so that you could rub off considerable brown material.

MR. HOGABOOM: I think probably, in all deference to Mr. Candee, if he had told you just exactly the problem of what he

is doing, it probably would help to explain some of these things. Mr. Candee has done some very excellent work and, in my opinion, he has found something that is quite different from what has generally been accepted. He is plating strip steel continuously for either B. X. cable or flexible cable of some kind. That is a continuous process and it is quite rapid in going through, and, therefore, the solutions must be quick acting. But he has found, evidently, that our opinion that embrittlement may be caused in the plating solution is not wholly correct; that a good deal of the embrittlement may be caused in the pickle, and if we had the proper pickle before we had the plating solution, then we do not get the effect that is generally attributed to the plating solution. In the study of this he has shown us that we can plate or pickle rapidly through a mechanical process, obtain a good deposit, and then form afterwards without having any danger of embrittlement from the plating solution, if we control and use the correct acid for pickling.

DR. BLUM: I should like to ask Mr. Candee whether he included in these tests the effect of boiling water immediately following the pickling operation; that is, passing it through boiling water or heating to a high temperature.

MR. CANDEE: No, we did not. We tried as near as possible to duplicate what we would actually use in practice, which is cold water rinse following our pickle.

DR. BLUM: Would there be any objection to a boiling water rinse if it were effective? I mention it because in work published a good many years ago by Langdon and Grossman, they found that one or two minutes in boiling water was as effective as standing for weeks in the air.

MR. CANDEE: Well, the longest time we have in any solution is eleven seconds, and the work would be in the water about four seconds, so there is some doubt about whether the four seconds would be long enough to be of much value.

MR. WALTER MEYER: Those gentlemen who had the opportunity to read the abstracts in the MONTHLY REVIEW for this past year probably noticed some abstracts that I had the honor of making on the effect of acids on hydrogen embrittlement. This work was done by Russian and German workers. They showed that the presence of small impurities has a pronounced effect on the hydrogen embrittlement. For instance,

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arsenic, phosphorus, sulphur, have a pronounced effect, and in doing commercial pickling operations we are never sure of the amount of arsenic or sulphur or hydride forming impurities that we may have present. It was believed that if no impurities were present, if just HCl or sulphuric was used, you would get no embrittlement. Then another Russian worker came out with a paper and said he got embrittlement on alloyed steels. Some work was then done on the over-voltage on alloy steels containing nickel and chromium, and it was found that with alloy steels containing nickel and chromium that had a higher hydrogen over-voltage, you got embrittlement without traces of these impurities that might act as hydrides or catalysts of embrittlement. I do not know whether Mr. Candee analyzed his acid or not.

MR. CANDEE: No; we, frankly, did not want to get acids free of arsenic, phosphorus and sulphur, because we knew we were to have probably more in actual practice than we had in our so-called chemically pure acids, so we took them as they came to us and used them in the concentrations that we have noted. I was aware of the effects of those catalysts, but without going through an extended study, which we did not think necessary, we did not feel we should bother with it.

MR. FRANK FORSBERG (American Steel & Wire Co., Worcester, Mass.): Like Mr. Candee, my company has been interested in the producing of galvanized strip steels for many years, and I appreciate fully the problem of embrittlement that comes in the use of acids for pickling. However, in plating continuously, as Mr. Candee has indicated, the time element is extremely short. The best you can do is twenty seconds. Consequently, you have to get fast action and in any of these jobs you have to produce a coating that is absolutely tight and flexible, because forming subsequently is the thing that the user of the strip steel must do and just depend on a coating that is tight and flexible.

There is one question which I would like to ask Mr. Candee. It is this: Of course, the strip steel that he gets probably is relatively free from any heavy oxides. Our problem involves the pickling or cleaning of a strip steel that has a fairly heavy oxide on it because it immediately follows a continuous annealing. In your opinion, would the anodic treatment pickle remove that oxide sufficiently so that you would get good cleaning?

MR. CANDEE: I might say that since this work was done a year and a half ago, we are actually getting steel that has not been pickled at the mill. It hasn't what you would call a heavy scale, but it is actually black. In the electrolytic pickle we use, the metal is in there nine seconds and we take it off in about one and one-half seconds. The rest of the time apparently it is perfectly bright. How much more we could take off I do not know, but we are actually pickling scaled metal in there in nine seconds. We get no embrittlement and we get cleaner metal. We prefer to get it that way because when the mill does not pickle it they do not get the metal full of oil and they seem to, at the same time, when they are handling pickled strip metal, shine it up. They do not do it purposely, but it is brighter, and when we pickle metal in our own plant we get a very dull mat finish on the steel which we consider ideal as a base for galvanizing.

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Industrial Cleaning Materials and Methods

The Abstract Section

PATRICK J. SHEEHAN, *Chairman, Program and Educational Committee*

Indium for reflectors. *Metal Progress*, Vol. **28**, No. I, page 56, July, 1935.—It is discovered that indium has better reflecting powers than any other metal or alloy. Indium reflects better than platinum-iridium or platinum-rhodium alloys because these alloys vary in brightness a great deal if the composition is changed but slightly. This is not a problem with indium as it does not need an assisting element. If an industrial use is found for indium the price of the metal will go down because it is found in appreciable quantities in zinc deposits and may be extracted cheaply. The metal may be plated from the chloride or sulphate solutions easily; pyridine, hydroxylamine, certain gums must be used as addition agents. The feature of this element's use as a reflector lies in the fact that only a very thin deposit is necessary to produce the best results. WM. GEISSMAN

The Structure of Electro-Deposits by D. J. NAUGHTON and A. W. HOTHERSALL. *Metal Cleaning & Finishing*, June, 1935, p. 285.—Microstructure of electro-deposited metals is studied before and after heat treatment. Examination indicated that hardness increased as grain size decreased. Finer grained deposits may vary considerably in hardness, with slight change in microstructure. More thorough tests were made of nickel deposits than other metals. Deposits were made from a nickel sulphate solution over varying degrees of pH. Additions of various salts and organic colloids were made. A table is included in the article, observing the range of characteristics so far determined with various metals. E. T. SHEEHAN

The Development and Control of Spangles on Galvanized Iron. By WALLACE A. IMHOFF, *Metal Cleaning & Finishing*, June, 1935, p. 281, Part V.—The regulation of pickling in securing a good spangle is discussed. Frequently, difficulties attributed to pickling are due to type of base metal. The reaction of improperly rolled steel, steels of high silicon, phosphorous, and sulphur content is observed. Similarly, "occluded hydrogen" responsible for dull rough spangles is traced to the base metal. It is true that a good steel improperly pickled will produce a poor spangle. However, the article impresses indirectly that an improper steel perfectly pickled and handled can never produce a good spangle. E. T. SHEEHAN

Cladding of Ferrous Products. RAYMOND R. ROGERS. *Ind. Eng. Chem.*, **27**, 782 (1935)—A method is described for producing an improved bond, free from inclusions, between for example an 18-8 chromium-nickel steel and ordinary steel. This is accomplished by pickling the stainless steel anodically in about 6 $\underline{N}$ hydrochloric acid, and immediately depositing on it a layer of about 0.003 inch of iron from the ferrous chloride-calcium chloride

bath. A piece of ordinary iron is then placed against the electrolytic iron surface, and the combination is heated and rolled to the desired thickness. Other combinations of metals may be used. (This method is of interest to electro-platers, not only because it involves iron deposition, but also because stainless clad steel may be in competition with plated steel. Abs.)

W. BLUM

Precious Metals as Materials of Construction. FRED E. CARTER. *Ind. Eng. Chem.*, **27**, 751 (1935)—In a summary of the industrial uses of gold, silver and the platinum metals, brief references are made to developments in plating of platinum, rhodium, and palladium; and a photograph of a large rhodium plated reflector is included. W. BLUM

Specifications for Cathodic Coatings. C. F. J. FRANCIS-CARTER. *J. Electrodepositors' Tech. Soc.* (preprint) **10**, 69 (1935)—By "cathodic" coatings the author means "noble" coatings, that is, those metals that do not furnish protection against corrosion of any exposed base metal. The paper relates chiefly to deposits of nickel and chromium on steel. "Process" specifications refer especially to plant practice and are useful for control but "inspection" specifications are necessary for acceptance of finished products. The latter may include requirements for appearance, adhesion, thickness (preferably minimum thickness), and porosity. The principles are illustrated by typical specifications, including the requirements of the United States Government for plumbing fixtures, French Railways for nickel on brass and steel, a French cycle factory for nickel and chromium on steel, an English plating shop, and Morris Motors of Oxford, England. The author emphasizes the increasing need for, and value, of specifications for plating. W. BLUM

Specifications for Anodic Deposits (*Zinc and Cadmium*), S. WERNICK *J. Electrodepositors' Tech. Soc.* (preprint) **10**, 85 (1935)—The author designates as "anodic deposits" those coatings such as zinc and cadmium that dissolve more readily than the base metal (usually steel). (NOTE: The term "anodic coating" should not be confused with the coating of oxide produced on aluminum by anodic oxidation. Abs.) Process specifications are useful in a plant, but purchase specifications are the more important for the users. A purchase specification should include requirements for appearance, average thickness, uniformity of distribution, adhesion and protective value. The author proposes a specification for cadmium plating with the following definite requirements. (1) Good appearance and uniformity in color, (2) an average thickness not less than 0.00023 inch nor more than 0.00046 inch, (3) good adherence, (4) resistance to a 10-percent salt spray for 4 days, in each of which the articles are sprayed 8 hours and left in the box 16 hours, and (5) resistance to 90-percent humidity at 95° F. for 6 months. W. BLUM

The Testing of Electrodeposited Coatings, L. C. BANNISTER. *J. Electrodepositors' Tech. Soc.* (preprint) **10**, 97 (1935)—The author reviews methods of testing electrodeposits for appearance, composition, thickness

(average and local), adherence, internal stress, hardness, wear resistance, and protective value of tests of porosity and accelerated corrosion.

W. BLUM

METALS AND ALLOYS ABSTRACTS

PHIL J. RITZENTHALER

1. Grinding Stainless Steel Welds. E. P. GRESINER. *Abrasive Industry*, Vol. **16**, Feb. 1935, pp. 9-10—Flexible Shaft grinding wheel usually necessary as weld structure is generally too bulky to be brought to wheel. Practical technique to finish weld is given, as well as correct abrasives to use.

2. Year's Progress in Metal Finishes. H. R. SIMONDS. *Iron Age*, Vol. **135**, Jan. 10, 1935, pp. 24-29—Year's review in metal finishing, including results of exposure tests. Most important development in Protection was in heavy zinc coating. Important progress in burnishing and pickling. Improvement in lacquers and enamels. European developments were (a) electrocleaning and hot galvanizing; (b) spreading aluminum powder over zinc both to prevent oxididation of zinc and to give galvanized product a silvery finish; (c) coloring aluminum with oxalic acid; (d) German process for bright nickel plating.

3. Sales Production with Attractive Finishes. H. R. SIMONDS. *Iron Age*, Vol. **134**, Nov. 22, 1934, pp. 19-23—A description of practical experience in finishing many products as bolts and nuts, auto coil springs, bells, keys, structural aluminum, golf clubs, etc.

4. Recent Investigation on Pickling of Iron. W. MASCHE. *Korrosion and Metallschuts*, Vol. **10**, Dec. 1934, pp. 278-288—Various methods of pickling, nature of action and effect of inhibitors, were studied. Effect of inhibitor is greater absorption of colloid by pure iron than scale. Resistance of this absorbed layer increased by gelatin. Experiments described in detail.

5. Surface Cracks in Castings Due to Pickling. C. W. BRIGGS and R. S. GEZELIUS. *Metals and Alloys*, Vol. **6**, Feb. 1935—Results show hydrogen embrittlement in pickling. By annealing before pickling and using inhibitors and boiling work in hot water, embrittlement may be lessened, but action of acids and internal stresses in castings make it better not to use wherever possible.

6. The Cleaning of Metals; Degreasing. S. WERNICK. *Industrial Chemist*, Vol. **10**, Dec. 1934, pp. 479-481—Use and properties of ethylene trichloride were given with details of a small degreasing installation.

7. Bullard-Dunn Process for Car Parts. *Iron Age*, Vol. **134**, Dec. 20, 1934, pp. 28-30—Description of this cleaning process in use in Detroit Automotive Plant. Process also used for internal cleaning, as in oil line. Results cheaper and better than other methods.

8. Surface Finish Measurements and Specifications. E. U. ABBOT *S. A. E. Journal*, Vol. **36**, March, 1935, pp. 112-116—Profilographs are shown in which surface irregularities can be measured in inch units. Examination of $\frac{1}{4}$" of surface sufficient in most cases as magnification shows up irregularities very well. Comparison of this method with several others is given.

9. New Method of Deposition of Metals and Alloys. DR. SCHLOTTER. *Oberflachtechnick*, Vol. **12**, Feb. 19, 1935, pp. 45-46—A serious objection to Cyanide baths is their poisonous nature. This method replaces these with non-poisonous thiocyanogen compounds, giving good deposits.

Silver bath is: 1. Silver thiocyanate, 33G/l. 2. Sod. thiocyanate, 20G/l. 3. Water, 1L.

Copper Bath: 1. Copper Thiocyanate, 40G/l. 2. Ammonium Thiocyanate, 200G/l. 3. Sodium sulphite, 10G/l. 4. Water, 1L.

Bath voltage 0.5,-C.D.=100 A/sq. meter eff=98.5%. Deposit is dense and firmly adherent and has a better brightness than from cyanide bath. Brightness can be increased by colloid additions.

10. Sources of Defects in Nickel Plating. ROBERT C. SNELLING. *Chemiker-Zeitung*, Vol. **58**, Oct. 1934, pp. 860-862—Black color of Ni deposit due to ler, zu, etc. Dark color due to solution being too cool, not acid enough, or too low current density. Presence of grease or oil, colors deposit yellow. Irregular color, spotty and streaky deposits due to articles not being clean or insufficient conducting salts. Very high power results in burned deposits. Organic matter or colloids make bright and shiny deposit.

11. Electrogalvanizing Wire. *Steel*, Vol. **95**, Dec. 24, 1934, pp. 22-24—Article describes Bethanizing process used in Bethlehem Steel Plant. Bright steel wire, after annealing in lead bath, is cleaned electrolytically in fused caustic soda and then in acid. Zinc is deposited in cells 55 ft. long and 8 wires wide. Zinc anodes extend entire length. Acid bath using zinc sulphate is used. Current density, 700-1400 amp./sq.ft. Coating claimed to be so ductile that it will not crack, flake or chip on distortion.

12. Chevrolet Brake Parts Plated. *Automotive Industry*, Vol. **71**, Dec. 22, 1934, p. 778—Chevrolet plated parts of brake linkage at wheel with cadmium, zinc or chromium. Cadmium and chromium also useful to reduce friction.

71. Eloxal Process for Anodic Oxidization of Aluminum—Electrolytic oxidization of aluminum and alloys and its applications are discussed. Its uses are for wear, hardness, electrical insulation, or ornamental, as coating can be colored with dyes.

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Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTRO-PLATERS' SOCIETY

HARTFORD BRANCH

The Hartford Branch of the A.E.S. held its June meeting on Monday evening, June 24, 1935, at the Elks' Club, Bristol, Conn. The meeting was called to order at 8:30 P.M., with President St. Pierre in the chair. Minutes of the previous meeting were read and accepted. All communications were read and placed on file. No bills were presented. One applicant, Mr. H. C. Duggan, of the Oakite Products Co., was elected to associate membership.

At this meeting the following officers were installed for the year 1935-36. President, Mr. Jas. St. Pierre; Vice-President, Mr. Chas. Peterson; Secretary-Treasurer, Mr. V. E. Grant; Librarian, Mr. W. E. Bancroft.

The Board of Managers were as follows: Mr. H. R. MacFadyen, Mr. W. E. Bancroft, Mr. W. D. MacDermid.

It was voted at this meeting to change the meeting night from the fourth Monday to the *second* Monday of the month so as not to conflict with the meeting night of the Springfield Branch, which is on the *fourth* Monday of the month. It was also voted to cancel the July and August meetings due to the extreme heat, and also because of so many foremen being away on vacations.

The meeting was attended by twelve members and was adjourned at 11:00 P.M.

V. E. GRANT, *Sec'y*

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held July 13, 1935, at the Atlantic Hotel.

President F. Herbst presided and all other officers present. A new application from W. R. Erskine read and a committee appointed on same. Mr. C. H. Buckshorn was elected to active membership.

Mr. O. Holmbacker one of the oldest members of Chicago Branch resigned due to continued illness. Chicago Branch members extend their sympathy to Mr. Holmbacker and hope that he has a rapid recovery.

Mr. F. J. Hanlon read the delegates' report on the Bridgeport Convention. It was a very fine, interesting and complete report and proved to all present that Bridgeport must have had a very successful convention.

Mr. O. E. Servis, the Librarian, found the following questions in the question box.

No. 1. *How is a satin finish made on stainless steel and what kind of wheels and what speed to use to make this finish?*

Answer. Use a loose soft buff at about 1600 R. for a dull finish with a greaseless compound, for brighter shades increase your speed and use a harder buff.

No. 2. *What is the best formula, in use in a job shop, for nickel plating steel stampings to be chrome plated, and what operating conditions should exist?*

Answer. Use a hot nickel solution if possible. 32 oz. Single Nickel Salts, 4 oz. Ammonium Chloride, 4 oz. Boric Acid, P.H. 5, Temp. 110°.

No. 3. What is the best method of metallizing hard rubber door handles for plating?

Answer. Use a solvent to soften the rubber just enough to make it sticky, then spray with copper bronze powder dry and run in an acid copper tank.

No. 4. Is an acid tin solution as good as a cyanide tin solution as to throwing power? What is the difference in the cost of the up-keep?

Answer. The cyanide tin is the best for the throwing power. The cost of the up-keep is about the same as long as you keep the caustic content correct in the cyanide tin bath.

No. 5. What is the average life of a chrome plating solution? After polishing red brass castings what is the method used for nickel plating these castings before chrome plating?

Answer. There is no limit to the life of a chrome plating bath, as long as impurities are kept out of it. After polishing red brass castings, clean in a mild cleaner, flash in a cyanide copper, rinse, dip in a mild acid dip, rinse, and nickel plate.

J. W. HANLON, *Sec.-Treas.*

MILWAUKEE BRANCH

Milwaukee Branch did not have a meeting in June, as three of the officers were attending the Bridgeport Convention. The meeting was postponed to July and on July 11 we held our regular meeting. In spite of the hot weather we had a large attendance. After the regular order of business, Mr. Ackerman of the Manitowoc Tinsel Co., a newly elected member, was initiated. This was followed by the Convention Delegate's Report which took about one hour as the papers presented at the Convention were discussed.

The newly elected officers were then installed by our old friend Ray Goodsell of Racine, Wis.: President, Robert Steuernagel; Vice-President, Dexter Rhodes; Secretary-Treasurer, Roman Binder; Librarian, Al. Hermansen; Assistant Librarian, Henry Bornitzke; Board of Managers, H. Jeger, Jack Geisman, Henry Binder.

As the hour was late and it was warm, the question box and report of our Librarian, Al Hermansen, were cut short to allow the members and friends to partake of the refreshments and entertainment. It was a jollification meeting to the end and good cheer prevailed. We had a number of visitors. Our old friends Oscar Servis,

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Jake Hay, Frank Barry of Chicago, and a large number from other cities of Wisconsin were on hand to help make merry. Our retiring President, Pat Sheehan, newly elected Second Vice-President of the Supreme Society, was the center of congratulations.

ROMAN BINDER, *Sec'y-Treas.*

As our bank roll is very healthy again the boys decided we should have a picnic. Paul Krouse, Frank Marx, and Jack Geisman were appointed a committee to make arrangements.

DETROIT BRANCH

A regular meeting of the Detroit Branch, American Electro-Platers' Society, was held at the Hotel Statler, Detroit, Michigan, Friday evening, June 7th, at 8:00 P.M., Col. Hansjosten presiding. The Minutes of the previous meeting were read and approved.

Applications of Mr. Rob't K. Stoll (Associate), 1530 E. Hancock Ave., Detroit, and Mr. Jas. L. Germaine (Active) 5922 Commonwealth Ave. were read and referred to the Board of Managers for investigation and action to be reported at our next meeting. Resignations of Messrs. Flanagan and Sutcliffe were accepted with regrets.

The Delegates to the Convention were instructed to vote for any Mid-west city for the Convention of 1936, except Detroit. The report of the President was read and approved. Secretary's report read and approved as follows:

Membership Report for fiscal year May 31, 1934 to June 1, 1935

Associate	14	27
Active	44	55
Honorary	1	1
Total	59	83

Elected to Membership
Associate 6, Active 17, Total 23
Reinstated Active 5
Deceased:
Active 2
Suspended 2 Transferred 1

The Treasurer's report was then read and Board of Managers having approved, was accepted as read. Treasurer reported a balance of $1,226.99 on June 1st. The installation of officers then took place. Col. Hansjosten performed the duties of Installation Officer very well.

Mr. Chas. Eldridge was appointed by our new President, Mr. W. W. McCord, as Chairman of the Program Committee for the ensuing year. As Chairman of this Committee, Mr. McCord, as well as the whole Society, hope he will do as well as he has done in the past in this capacity. However, in order to help Mr. Eldridge, and not have all the work upon his shoulders, the following were also appointed on this Committee: Messrs. Lewis, Cherry, Soderberg, Kirby, Nankervis, and Southwick.

In the Question Box, which was then taken up by our new Librarian, Mr. Chester Marshall, were found two questions:

Q. How long may a nickel solution pH about 5.7 be stored in a steel tank without picking up iron in harmful amounts?

A. 72 hours without much pollution of iron.

Q. Of what importance is anode current density in a nickle solution?

A. High current density gives a rough deposit. A low current density is safe. Current density is governed by chloride content in solution.

The meeting adjourned at 9:30

P.M., until the first Friday in September.

T. C. EICHSTAEDT, *Sec.-Treas.*

ROCHESTER BRANCH

On June 21 the Rochester Branch held its regular monthly meeting.

After regular business, the election of officers took place and the following were elected for the ensuing year:

President, F. J. Kohlmeier; Vice-President, Charles Hehr; Secretary-Treasurer, Judson R. Elster; Librarian, Jack Snyder; Educational Chairman, R. L. DelRosso; Board of Managers, S. P. Gartland, Geo. Scobell, Chas. H. Burnett.

Jack Snyder was appointed to have charge of the picnic committee and instructed to arrange a picnic for as soon as possible.

A report was then given by the delegates to the convention and they could not praise the work of the men in charge of this convention too highly. All in all they said it was a very successful convention. After this report the meeting was adjourned.

On July 19th the regular monthly meeting was held at the Hotel Seneca. After routine business the committee in charge of the picnic gave its report. The picnic is to be held on Saturday afternoon August 10th at the Summer Circle Spot on Lewiston Ave., just east of Kodak Park. Tickets are to be $1.00 for ladies and $1.25 for gents. This will include a seven-course chicken or steak dinner and a sufficient supply of BEER, POP, SUCKERS and everything that goes with a real picnic to satisfy everyone. Anyone who wishes is invited to attend and can secure reservations by getting in touch with the Secretary of this Branch. As there was no further business the meeting was adjourned.

JUDSON R. ELSTER, *Sec.*

BRIDGEPORT BRANCH

At the July meeting of the Bridgeport Branch the following men were elected to membership: John D. O'Connell, 93 Mechanic St., Fitchburg, Mass., (Active), Edward E. Andrew, 182 Fairlawn Ave., Waterbury, Conn., (Active), R. J. Doucette, 160 Alder St., Waterbury, Conn., (Active) John E. Charleson, Yale & Towne Mfg., Stamford, Conn., (Assoc.), Dr. H. L. Kellner 16 Cherry Ave., Waterbury, Conn. (Assoc.)

The death of Dayton Lasher of 267 Sylvan Ave., Waterbury, a member of our Branch was sad news for the members.

The resignation of Wm. Kusterer of 442 Summit St., Bridgeport was accepted. Charles Trombetta of 4 Park St., Stamford, Conn., was suspended for non-payment of dues.

CHAS. H. COSTELLO, *Sec.*

GRAND RAPIDS BRANCH

Mr. Walley writes: "The spirit of Grand Rapids Branch has greatly improved and we have enjoyed some very good meetings in the past few months, I think the future looks like a real come-back to me."

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Membership Report

To July 18, 1935

APPLICATIONS

W. R. Erskine, 751 John St., Rockford Ill.
Active, Chicago Branch

Mr. Robert K. Stoll, 1530 E. Hancock Ave., Detroit, Mich.
Associate, Detroit Branch

Mr. Jas. L. Germaine, 5922 Commonwealth Ave., Detroit, Mich.
Active, Detroit Branch

ELECTED

Chas. C. Conley, 2505 Catalpa Drive, Dayton, Ohio
Active, Dayton Branch

Thomas McHugh, Cincinnati, Ohio (No street address given)
Active, Cincinnati Branch

Harold C. Duggan, 410 Asylum Street, Hartford, Conn.
Associate, Hartford Branch

Lionel Cinamon, 1126 Manor Ave., Bronx, N. Y.
Associate, New York Branch

Chas. H. Buckshorn, c/o Weston Hotel, 355 West Madison St., Chicago, Ill.
Active, Chicago Branch

Max Ackermann, c/o National Tinsel Mfg. Co., Manitowoc, Wis.
Active, Milwaukee Branch

William Rice, 34 Hillside Ave., New York City,
Active New York Branch

John D. O'Connell, 93 Mechanic St., Fitchburg, Mass.
Active, Fitchburg Branch

Edward E. Andrew, 182 Fairlawn Ave., Waterbury, Conn.
Active, Waterbury Branch

R. J. Doucette, 160 Alder St., Waterbury, Conn.
Active, Waterbury, Conn.

John E. Charleson, Yale & Towne Mfg., Stamford, Conn.
Associate, Stamford Branch

Dr. H. L. Kellner, 16 Cherry Ave., Waterbury, Conn.
Associate, Waterbury, Conn.

TRANSFERRED

G. Byron Hogaboom, Associate of Philadelphia Branch, transferred to Newark Branch.

George T. Turner, of Philadelphia Branch, transferred to Baltimore-Washington Branch.

REINSTATED

J. B. Hawley, 1317 Jefferson Ave., Grand Rapids, Mich.

Alfred Phillips, Box 214, Comstock, Mich.

Jacob Reingold, 673 Saratoga Ave., Brooklyn, N. Y.

RESIGNED

O. Holmbacker, 764 W. Macoff, Decatur, Ill. Chicago Branch

T. H. Flanagan, 5405 Lawton, Detroit, Mich. Detroit Branch

Arthur Sutcliffe, 2574 Pennsylvania Ave., Detroit, Mich. Detroit Branch

Wm. Kusterer, 442 Summit St., Bridgeport, Conn. Bridgeport Branch

SUSPENDED

Chas. Giordano, 108 West 90th St., New York City New York Branch

A. Raml, 312 S. Jefferson, Madison, Ind. Chicago Branch

Wm. Fox, Appolo Metal Works, LaSalle, Ill. Chicago Branch

W. Hasback, 3859 N. Sacramento Ave., Chicago, Ill. Chicago Branch

Jack Wiseman, General Delivery, Wyoming Park, Mich.

Chas. Trombetta, 4 Park St., Stamford, Conn., Stamford Branch

DEATHS

Martin B. Apy, 2010 New York Ave., Brooklyn, N. Y., member of New York Branch.

Dayton Lasher, 267 Sylvan Ave., Waterbury, Conn., member of Waterbury Branch.